JC02 Rec'd PCT/PTO 22 MAR 2002

FORM PTO-1390 (REV 9-2001) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		WSP:205 US
		U.S. APPLN. NO. (IF KNOWN, SEE 37 CFR 1.5) 10/088888
INTERNATIONAL APPLN. NO. PCT/DE00/03117	INTERNATIONAL FILING DATE September 6, 2000	PRIORITY DATE CLAIMED September 23, 1999
TITLE OF INVENTION **Method for Conditioning foundry moulding sand and a Device Therefor**		
APPLICANT(S) FOR DO/EO/US Paul Eirich, et al.		

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.

2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.

3. ☐ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.

4. ☐ The U.S. has been elected by the expiration of 19 months from the priority date (Article 31).

5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).

6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is attached hereto
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).

7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.

8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). UNSIGNED

10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.

13. ☒ A FIRST preliminary amendment.

14. ☐ A SECOND or SUBSEQUENT preliminary amendment.

15. ☐ A substitute specification.

16. ☐ A change of power of attorney and/or address letter.

17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.

18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).

19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).

20. ☒ Other items of information: **Certificate of Mailing with Express Mail No. EF155674282 US**

U.S. APPLN. NO. (if known, see 37 CFR 1.5) 10/088888	INTERNATIONAL APPLN. NO.	ATTORNEY'S DOCKET NUMBER

21. ☒ The following fees are submitted:	CALCULATIONS PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492(a)(1) - (5): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. **$1040.00**	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890.00**	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO. **$740.00**	
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$710.00**	
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) . . . . . **$ 100.00**	

ENTER APPROPRIATE BASIC FEE AMOUNT =				$890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	**23** - **20** =	**3**	X $18.00	$54.00	
Independent claims	**2** - **3** =	**0**	X $84.00	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $280.00	$	
TOTAL OF ABOVE CALCULATIONS =				$944.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.				$	
SUBTOTAL =				$	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$	
TOTAL FEES ENCLOSED =				$944.00	
				Amount to be: refunded	$
				charged	$

a. ☒ A check in the amount of $ to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. in the amount of $ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 04-1790. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

MICHAEL L. DUNN
DUNN & ASSOCIATES
P.O. BOX 10
NEWFANE, NEW YORK 14108

DATED: March 22, 2002

SIGNATURE

MICHAEL L. DUNN
NAME

25,330
REGISTRATION NUMBER

Docket No. WSP:205 US

CERTIFICATE OF MAILING

Express Mail Mailing Label No. EF155674282US

Date of Deposit **March 22, 2002**

I certify that this **TRANSMITTAL LETTER TO THE U.S. DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371** (First Submission) is being deposited with the U.S. Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to Assistant Commissioner for Patents, Washington, D.C. 20231.

Michael L. Dunn

Docket No. WSP:205 US

CERTIFICATE OF MAILING

Express Mail Mailing Label No. EF155674129US

Date of Deposit **July 29, 2002**

I certify that this **TRANSMITTAL LETTER TO THE U.S. DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371** (Second Submission) is being deposited with the U.S. Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to Assistant Commissioner for Patents, Washington, D.C. 20231.

Cheryl A. Hill

Cheryl A. Hill

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TITLE OF INVENTION **Method for Conditioning Foundry Moulding Sand and a Device Therefor**		
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PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Box PCT
Washington, D.C. 20231

Sir:

Please amend the specification as follows:

In the Claims

Please delete original Claims 1-22 and substitute new Claims 23-45 in their place.

23. Method for conditioning moulding sand in a mixer (1), wherein the moulding sand is heated to at least a minimum temperature and subsequently cooled from the minimum temperature using the effect of a vacuum in the mixer.

24. Method according to Claim 23, wherein a desired minimum temperature T_{min} is determined, the starting temperature T_{ist} of the moulding sand is determined, and the moulding sand is heated when $T_{ist} < T_{min}$.

25. Method according to Claim 23, wherein the moulding sand is heated before it is placed in the mixer (1).

26. Method according to Claim 23, wherein the moulding sand is heated to at least the minimum temperature in the mixer (1) prior to application of the vacuum.

27. Method according to Claim 23, wherein the moulding sand is heated with the aid of hot air or microwaves.

28. Method according to Claim 23, wherein the moulding sand is heated by addition of hot water.

29. Method according to Claim 23, wherein the moulding sand is heated by addition of hot water vapour (12).

30. Method according to Claim 29, wherein the temperature of the moulding sand is increased to at least the minimum temperature T_{min} by addition of hot water vapour (12).

31. Method according to Claim 23, wherein processing water (4) is added to obtain a desired minimum moisture.

32. Method according to Claim 30, wherein the moisture content of the moulding sand is sensed (14) enough water (4) is added as is necessary for cooling of the moulding sand in a vacuum and so that a quantity of water remains in the moulding sand for the moulding sand to obtain a desired moisture content in finished sand.

33. Method according to Claim 29, wherein water in vapour or liquid form added for heating the moulding sand is at least in part additionally used for moistening the moulding sand.

34. Method according to Claim 33, wherein excess water in the moulding sand is regulated by evaporation in a vacuum to a desired final moisture.

35. Method according to Claim 29, wherein the amount of water vapour or water added to the moulding sand to heat it is determined dependent upon the temperature T_{ist} of the moulding sand and the desired minimum temperature T_{min}.

36. Method according to Claim 29, wherein the amount of water vapour added to the moulding sand to heat it is obtained by setting a pressure in the mixer such that a boiling temperature of the water at the set pressure corresponds to the desired minimum temperature, and water vapour is supplied until the pressure increases or the temperature in a suction line (6) shows an accelerated increase.

37. Method according to Claim 23, wherein hot water or hot water vapour is supplied to the mixer below the surface of the moulding sand to heat the sand to at least the minimum temperature.

38. Method according to Claim 23, wherein moulding sand below the minimum temperature is heated by mixing with hot moulding sand.

39. Apparatus for conditioning moulding sand comprising a mixing agitator, a mixing container, means for vacuum sealing the mixing container, means for providing a vacuum in the mixing chamber, means for feeding components to be mixed to the mixer, means for supplying hot water or hot water vapour to components in the mixing chamber and means for removing mixed components from the mixing chamber.

40. Apparatus according to Claim 39, wherein means for adding hot water vapour or hot water comprises the agitator.

41. Apparatus according to Claim 40, wherein the agitator includes apertures through which hot water vapour or hot water is provided during agitator rotation.

42. Apparatus according to Claim 40, wherein the mixing container does not rotate, and orifices are provided through a wall of the container for the addition of hot water vapour and/or water.

43. Apparatus according to Claim 39, wherein the mixing container rotates and a conduit is provided for the addition of hot water vapour to the mix.

44. Apparatus according to Claim 43, wherein the conduit is provided in a wall scraper.

45. Apparatus according to Claim 43, wherein the conduit is provided in a baffle.

Respectfully submitted,

Dated: March 22, 2002

Michael L. Dunn
Attorney for Applicant(s)
Reg. No. 25,330
P.O. Box 10
Newfane, New York 14108
Telephone: (716) 433-1661

MLD/cah
cc: Weber, et al.

DECLARATION

I, Lesley Mary Harris, M.A., Dip. Trans.,

Of Ridgeback House
Curdridge Lane
Curdridge
GB – Hampshire SO32 2BJ

Do hereby declare that I am conversant with the German and English languages, and

I certify that the following translation of the attached document is, to the best of my knowledge and belief, a true and correct translation of the authentic text in the German language of International patent no. PCT/DE00/03117.

Dated this 2nd day of March 2002.

Lesley Harris

1prt

Method for conditioning foundry moulding sand, and device for this purpose

The invention relates to a method for conditioning of moulding sand, wherein the conditioning takes place at least in part in a vacuum. The present invention furthermore relates to a device for implementing the method.

The conditioning of sand for producing casting moulds is intended to produce the correct mixture ratio of grain sizes as well as the ratio of amounts of quartz sand, binder, powdered coal and used and new sand, to homogenise the mixture and thus to largely coat the grain with the binder, to regulate the correct moisture content, to remove unwanted components, to regulate the correct temperature of the moulding sand, and lastly to transport the ready, conditioned sand to where it is to be used.

In general, the used sand has a raised temperature of, for example, between 100°C and 140°C. As sand temperatures over approximately 50°C can present significant problems for moulding machines, and at too high temperatures variations in moisture in the finished sand occur because of uncontrollable evaporation losses on the way between the mixer and moulding installation, in this case the sand has to be cooled.

For this, fluidised bed coolers are mostly used that the sand continuously passes through by means of oscillatory movements of a sieve grate. The cooling principle is that water sprayed onto the sand with nozzles evaporates, and the evaporation enthalpy necessary for this is drawn from the sand as sensible heat. The disadvantage of the method is, however, that very large amounts of air are necessary for transporting away the water vapour occurring, which in turn requires additional energy use.

In DE 29 52 403 C2 therefore, an alternative cooling method was developed. In accordance with this, simultaneous conditioning and cooling of clay bonded foundry moulding sands takes place in a vacuum mixer. The individual components are firstly placed in the mixer. After a brief pre-homogenisation the temperature and moisture of the mixture is determined and the required amount of water added. Lastly, during the conditioning process, the pressure in the mixer is gradually lowered. As soon as the pressure corresponding to the vapour pressure curve of water is reached, the water in the sand begins to boil and draws the evaporation heat necessary for this from the sand.

In this way extremely effective cooling is obtained inexpensively.

The cooler of DE 29 52 403 C2 is only usefully employed when used sand is returned to the mixer at a temperature such that cooling is necessary.

After longer breaks in operation, for example at weekends or due to a breakdown, or where there is low thermal stressing of the moulding sand, for example, because of varying casting temperatures or varying cooling times for the cast shape, the low temperatures of the used sand temperatures do not necessitate cooling. In such cases the moulding sand mixer is operated without the vacuum. Even when used sand is expensively conditioned without a vacuum, it nevertheless differs from moulding sand that has been conditioned using a vacuum.

It is highly desirably in all foundries that the characteristics of the sand are kept as constant as possible in order to obtain consistent quality of the products of the moulding installation.

The object of the present invention is thus to provide a method and a device that ensure conditioning of the moulding sand in a vacuum regardless of the temperature of the used sand, provides a cooled moulding sand for further processing, and wherein the re-conditioned moulding sand attains constantly high quality values regardless of the temperature of the moulding sand.

This object is solved in accordance with the invention in that moulding sand not cooled down in a vacuum is heated before conditioning or during conditioning and subsequently cooled using the effect of the vacuum.

Prior heating ensures that even used sand that is already cooled can be conditioned with the aid of the vacuum technique.

It has however been shown in an unexpected manner that the addition of moisture and heat, in particular in the form of condensed vapour, and subsequent cooling and removal again of the moisture by evaporation in a vacuum leads to a qualitatively significantly better moulding sand than the direct use of cooled sand, possibly with moisture correction. Thus, by means of vacuum treatment of the moulding sand, in

addition to the advantageous cooling effect, more advantageous quality characteristics of the conditioned moulding sand are obtained. Thus, for example, flow capability, gas permeability and moulding stability of the moulding sand prepared in a vacuum are demonstrably increased.

An embodiment is particularly preferred in which a minimum temperature T_{min} is pre-determined and the temperature of the moulding sand T_{ist} is determined and the moulding sand is heated when the temperature of the moulding sand is less than the pre-determined minimum temperature ($T_{ist} < T_{min}$).

In this way it is ensured that the moulding sand is not heated when it is already at a sufficiently high temperature. In this way it is possible to keep the energy use as low as possible. On the other hand, the temperature of the moulding sand is advantageously regulated as exactly as possible to the temperature T_{min} so that conditioning can take place under consistent conditions, and the conditioned sand has a consistent, extremely high quality.

The measurement of temperature and/or moisture can selectively be done with the used sand delivery or in the mixer by means of suitable probes.

In this way it is possible to heat the sand both before it is put into the mixer as well as in the mixer. The heating of the moulding sand can be done, for example, with the aid of moisture-saturated hot air, heat radiation or microwaves.

Preferred embodiments of the present invention, however, provide that the moulding sand is heated by the addition of hot water and/or by hot water vapour.

In a particularly preferred embodiment of the method according to the invention, temperature measurement of the used sand is done ahead of or in the mixer. If the temperature sensed is above the minimum temperature set for vacuum cooling, the conditioning and cooling of the sand take place in the known manner. If, however, the temperature of the used sand is below the set minimum temperature, preferably hot vapour is blown into the cold moulding sand. This vapour condenses in the mixer and thereby heats the moulding sand to the desired minimum temperature. As soon as the set temperature is reached, the supply of vapour is stopped and the moulding sand is

cooled to the desired final temperature by application of a vacuum.

For reasons of cost, the amount of hot vapour added is preferably kept low.

As already described in the introduction, a certain minimum moisture content of the used sand is necessary so that the conditioned moulding sand attains the final moisture and is provided with sufficient malleability. A particularly advantageous embodiment of the present invention provides that if the temperature difference between the temperature of the used sand and the set minimum temperature is so small that amount of water condensed in the sand by the addition of hot vapour is not sufficient to provide the moulding sand with the desired final moisture, processing water is also added to the moulding sand in addition to the water vapour.

Under certain conditions it is sufficient when hot water alone is added in order to obtain the desired heating.

Where, after cooling, the final moisture in the moulding sand is too great, evaporation in a vacuum is continued until the desired final moisture is obtained.

Even where the addition of the hot vapour to the moulding sand preferably takes place within the mixer, the addition of the hot vapour to the transport or storage area or also in the debris pile is possible. The addition of vapour in the mixer has the advantage that portions of the mix wetted with vapour are continuously in motion and therefore reliably come into contact with the portions that are not yet wetted. As a result the mix mixes well with the water vapour.

By conditioning the sand in a vapour atmosphere, the clay binder, usually bentonite, is clearly better penetrated and activated by the water. Because of the better penetration of the binder with water a more even distribution of moisture is produced in the binder covering, and as a result of this better flow capability of the moulding sand when the mould is filled.

Where the addition of the vapour is done into the pile of sand debris, it is particularly advantageous for the hot vapour to be added via an injecting lance that ends as deeply as possible inside the layer of sand so that the hot vapour condenses completely in the

sand without losses.

Where the addition of vapour is into the mixer, alternatively a hollow shaft or another machine part extending into the mixture, for example, a wall scraper, is configured hollow to be used as an injection lance. When the vapour is added via the hollow shaft of the mixing apparatus, it is recommended that the outlets of the vapour line be arranged such that they open out to the rear (as seen in the direction of rotation) of the mixing fins or blades.

When moulding sand is mixed using non-rotary mixing containers, the addition of vapour is preferably done through a side opening in the lower wall area of the mixing container.

In a preferred embodiment, the moisture content and the temperature of the used sand is measured and compared to the pre-determined reference values for the finished sand. From this the amount of water is calculated, and added, that is necessary for cooling and moistening the moulding sand.

Preferably the amount of vapour necessary for heating is also determined by comparing the input temperature with the pre-determined minimum temperature. Where the amount of vapour to be provided is insufficient to obtain the desired moisture content in the finished sand, processing water is also added.

An alternative possibility for determining the amount of vapour to be added is that before or during the addition of vapour into the mixer, a pressure is set whereby the boiling temperature of the water corresponds to the desired final temperature. Vapour is added until the pressure or the temperature of the water-vapour mixture above the mix increases. The water vapour added condenses in the mix so long as the temperature of the mix is below the desired minimum temperature. When the temperature of the moulding sand reaches the minimum temperature, the condensation process ends and the vapour pressure above the mix increases. This vapour pressure can be determined. The abrupt increase in the vapour pressure is then an indicator that sufficient hot vapour has been supplied.

The increase in the vapour pressure can be rather indistinct, however, particularly in

the case of large-diameter vacuum pumps. In this case it is advantageous to measure the temperature of the vapour that generally to passes via a drain to a condenser. When the condensation process stops in the mix, the temperature in the drain greatly increases. This can also serve as an indicator that sufficient water vapour has been put into the mix.

In this case, the amount of water required for the malleability of the sand or respectively for the desired moisture content must be determined separately.

A particularly energy-saving embodiment of the present invention provides that, where necessary, heating of the moulding sand is done by suitable mixing with hot used sand. It is thus possible, for example, that hot used sand is stored in a silo, and where necessary mixed with cold used sand so that the temperature of the used sand mixture is increased to the minimum temperature and consequently only a small amount, or even no heating by adding vapour or hot water is necessary.

Further advantages, features and possibilities for application will become evident from the following description of a preferred embodiment with reference to the attached drawing.

There is shown, in:

Fig. 1 a schematic representation of the method according to the invention and the device.

In Figure 1 the mixer 1 is clearly shown at the bottom left. Used, and possibly also new sand is added at 2, and as required mixed with filter dust, bentonite and powdered coal 3. The temperature T_{ist} and the moisture content of the used sand are determined by the temperature sensor 13 and the moisture sensor 14 prior to said used sand being placed in the mixer 1.

A programmable control system (not shown) compares the temperature T_{ist} with a pre-determined minimum temperature T_{min}. If the temperature of the used sand is below the pre-determined minimum temperature hot vapour is injected into the mixer via the vapour supply 12 until the mixture reaches the pre-determined minimum temperature.

The amount to be supplied can be calculated, for example, from T_{ist} (and naturally from the amount of mixture). Alternatively, a further temperature sensor can be arranged in the mixer, which sensor senses the temperature of the mix so that the addition of hot vapour can be stopped once the minimum temperature is reached. A further possibility for determining the amount of vapour to be supplied is in that a vacuum is created in the mix-cooler so that the (low) pressure set pushes the boiling temperature of water to the pre-determined minimum temperature. If water vapour is now supplied, it condenses in the mixture for as long as the temperature of the mixture is below the minimum temperature. As soon as the minimum temperature is reached the condensation process is stopped and the temperature of the gas (water vapour) pumped away by the line 6 abruptly increases from the minimum temperature to a greatly higher value, that substantially corresponds to the temperature of the water vapour supplied. To the extent that the temperature in the line 6 is sensed, the abrupt increase in temperature in the line 6 can be used as a signal to terminate the supply of vapour.

From the moisture content it is calculated whether the amount of vapour supplied is sufficient to give the moulding sand its desired final moisture. If this is not the case, fresh water 5 or circulation water 8 as processing water is supplied via the balance or metering apparatus 4.

After addition of the hot vapour and possibly of the processing water, the pressure in the mix-cooler is gradually reduced with the aid of the vacuum unit 9, until the boiling temperature of the water corresponds to the desired final temperature (for example, 30 - 40°C). The water contained in the mixture partly evaporates and the evaporation heat necessary for this is drawn from the mixture. The evaporated water is fed via the line 6 to a condenser 7. Here, the water vapour condenses again and is fed again via the heat exchanger 11 into the circulation water. Another water circulation is responsible for cooling the vacuum unit 9 and the heat exchanger 11, and is provided for this purpose with a cooling tower 10.

Claims

1. Method for conditioning moulding sand in a mixer (1), wherein the conditioning takes place at least in part in a vacuum, characterised in that moulding sand not cooled in a vacuum is heated before or during conditioning and subsequently cooled using the effect of the vacuum.

2. Method according to claim 1, characterised in that a minimum temperature T_{min} is pre-determined, that the temperature T_{ist} of the moulding sand is determined, and that the moulding sand is heated when $T_{ist} < T_{min.}$

3. Method according to claim 1 or 2, characterised in that the moulding sand is heated before it is placed in the mixer (1).

4. Method according to one of claims 1 to 3, characterised in that the moulding sand is heated in the mixer (1).

5. Method according to one of claims 1 to 4, characterised in that the moulding sand is heated with the aid of hot air, heat radiation of microwaves.

6. Method according to one of claims 1 to 5, characterised in that the moulding sand is heated by addition of hot water.

7. Method according to one of claims 1 to 6, characterised in that the moulding sand is heated by addition of hot water vapour (12).

8. Method according to claim 7, characterised in that the temperature of the moulding sand is increased by addition of hot water vapour (12) substantially to the minimum temperature T_{min}.

9. Method according to one of claims 1 to 8, characterised in that where necessary, processing water (4) is added.

10. Method according to claim 8 and 9, characterised in that the moisture content

at least one mixing tool, and a device for removing the finished mixture, characterised in that the mixer (1) is provided with at least one supply means (12) for hot water and/or hot water vapour.

18. Device according to claim 17, characterised in that the addition of hot water vapour and/or water is done by means of at least one mixing tool.

19. Device according to claim 18, characterised in that the addition of hot water vapour and/or water through apertures in the free ends or in the rear edges (seen in the direction of rotation) of rotating mixing tool blades.

20. Mixer (1) according to claim 18, characterised in that the mixing container 1 does not rotate, and the addition of hot water vapour and/or water takes place through a wall of the mixer (1) preferably inside the layer of mix.

21. Mixer (1) according to claim 17, characterised in that the mixing container (1) rotates and the addition (12) of hot water vapour takes place through a lance tube or a hollow shaft, preferably inside the layer of mix.

22. Mixer (1) according to claim 20, characterised in that the lance tube or the hollow shaft is configured as a wall scraper and/or as a material deflector.

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

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(71) Anmelder *(für alle Bestimmungsstaaten mit Ausnahme von US)*: **MASCHINENFABRIK GUSTAV EIRICH** [DE/DE]; Walldürner Strasse 50, 74736 Hardheim (DE).

(72) Erfinder; und

(75) Erfinder/Anmelder *(nur für US)*: **EIRICH, Paul** [DE/DE]; Bahnhofstrasse 22, 74736 Hardheim (DE). **EIRICH, Hubert** [DE/DE]; Sandweg 16, 74736 Hardheim (DE). **EIRICH, Walter** [DE/DE]; Spessartweg 16, 74736 Hardheim (DE). **DÜRR, Herbert** [DE/DE]; Bürgermeister-Schüßler-Strasse 29, 74722 Buchen (DE).

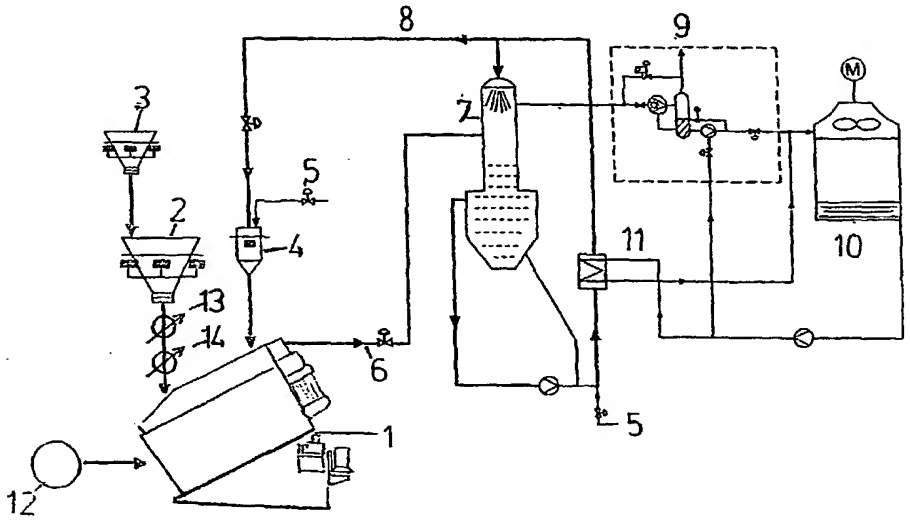
(74) Anwalt: **WEBER, Seiffert, Lieke**; Postfach 61 45, 65051 Wiesbaden (DE).

(81) Bestimmungsstaaten *(national)*: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW.

[Fortsetzung auf der nächsten Seite]

(54) Title: METHOD FOR CONDITIONING FOUNDRY MOULDING SAND AND A DEVICE THEREFOR

(54) Bezeichnung: VERFAHREN ZUR AUFBEREITUNG VON GIESSEREIFORMSAND UND VORRICHTUNG HIERFÜR



(57) Abstract: The present invention relates to a method for conditioning moulding sand. Conditioning is at least partially carried out under a vacuum. The present invention also relates to a device for carrying out said method. Moulding sand that is not cooled under a vacuum is heated before or during conditioning and is subsequently cooled under a vacuum influence. Conditioning of the moulding sand under vacuum is thus guaranteed regardless of the temperature of the sand. Moreover, cooled moulding sand is provided for further treatment. The re-conditioned moulding sand is provided with quality values that remain equally high regardless of the temperature of the moulding sand.

[Fortsetzung auf der nächsten Seite]

WO 01/21341 A1

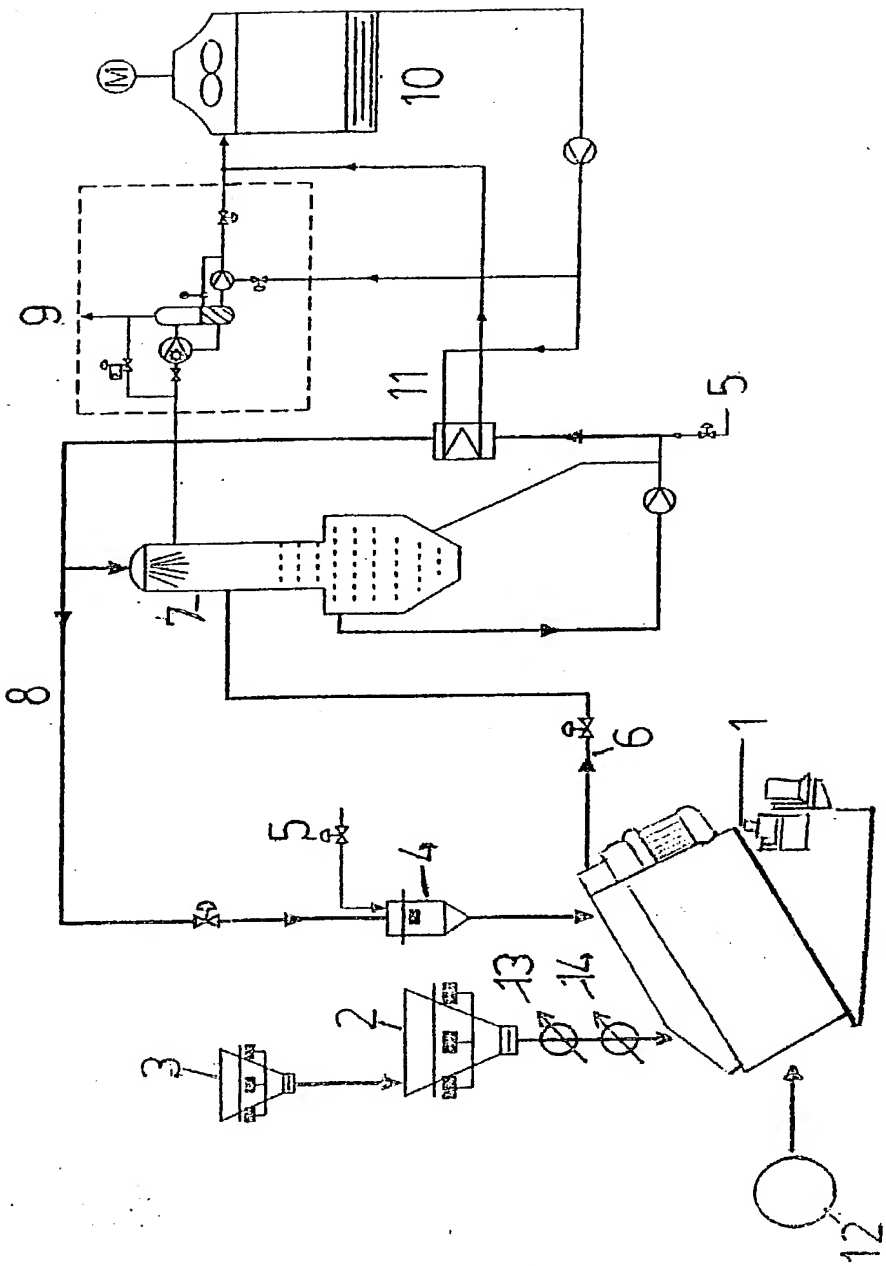


Fig. 1

Rec'd PCT/PTO 29 JUL 2002 #4

10/088888

PTO/SB/81 (02-01)

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Application Number	10/088,888
Filing Date	
First Named Inventor	Paul Eirich
Title	Method for Conditioning Foundry Moulding Sand and a Device therefor
Group Art Unit	Not yet assigned
Examiner Name	Not yet assigned
Attorney Docket Number	WSP:205 US

Express Mail No. EF155674129US

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Name	Registration Number
Michael L. Dunn	25,330
Howard M. Ellis	25,856
Robert P. Simpson	33,034

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City	Newfane	State	New York	Zip	14108
Country	U.S.A.				
Telephone	716-433-1661	Fax	716-433-1665		

I am the:

☒ Applicant/Inventor.

☐ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

SIGNATURE of Applicant or Assignee of Record

Name	**Paul Eirich**
Signature	
Date	05.05.02

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

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10/088888

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I am the:

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SIGNATURE of Applicant or Assignee of Record

Name	**Hubert Eirich**
Signature	H Eir
Date	05.05.02

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Examiner Name	Not yet assigned
Attorney Docket Number	WSP:205 US

Express Mail No. EF155674129US

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Address					
City	Newfane	State	New York	Zip	14108
Country	U.S.A.				
Telephone	716-433-1661	Fax	716-433-1665		

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☒ Applicant/Inventor.

☐ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

SIGNATURE of Applicant or Assignee of Record

Name	**Walter Eirich**
Signature	W. Eirich
Date	05.05.02

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing OR ☑ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	WSP:205 US
First Named Inventor	Paul Eirich
COMPLETE IF KNOWN	
Application Number	10/088,888
Filing Date	
Art Unit	
Examiner Name	

As the below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original and first inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD FOR CONDITIONING FOUNDRY MOULDING SAND AND A DEVICE THEREFOR

Express Mail No. EF155674129US

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☑ was filed on (MM/DD/YYYY) 09/06/2000 as United States Application Number or PCT International Application Number PCT/DE00/03117 and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	Certified Copy Attached? NO
199 45 569.4	Germany	09/23/1999	☐	☐	☑
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

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DECLARATION — Utility or Design Patent Application

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Michael L. Dunn, Dunn & Associates
Name

P.O. Box 10
Address

Newfane	New York	14108
City	State	ZIP

U.S.A.	716-433-1661	716-433-1665
Country	Telephone	Fax

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NAME OF SOLE OR FIRST INVENTOR : ☐ A petition has been filed for this unsigned inventor

1-w

Given Name (first and middle [if any]): Paul	Family Name or Surname: Eirich

Inventor's Signature: [signature] Date: June 27th, 2002

Hardheim		Germany	German
Residence: City	State	Country	Citizenship

DEX

Bahnhofstrasse 22
Mailing Address

Hardheim		74736	Germany
City	State	ZIP	Country

NAME OF SECOND INVENTOR: ☐ A petition has been filed for this unsigned inventor

2-w

Given Name (first and middle [if any]): Hubert	Family Name or Surname: Eirich

Inventor's Signature: [signature] Date: June 28th, 2002

Hardheim		Germany	German
Residence: City	State	Country	Citizenship

DEX

Sandweg 16
Mailing Address

Hardheim		74736	Germany
City	State	ZIP	Country

☑ Additional inventors are being named on the 1 supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.

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DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet
Page 1 of 1

Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Walter		Eirich	
Given Name		Family Name or Surname	
Inventor's Signature Walter Eirich			Date July 7th, 2002
Hardheim		Germany	German
Residence: City	State	Country	Citizenship
Spessartweg 16			
Mailing Address			
Mailing Address			
Hardheim		74736	
City	State	ZIP	Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name		Family Name or Surname	
Inventor's Signature			Date
Residence: City	State	Country	Citizenship
Mailing Address			
Mailing Address			
City	State	ZIP	Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
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